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## CENTIPEDES OF THE SMITHSONIAN-BREDIN EXPEDITIONS TO THE WEST INDIES

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### Introduction

This report is based upon the centipedes collected in 1956 and 1958 by the Smithsonian-Bredin expeditions to the Lesser Antilles. From the islands in the Leeward and more northern part of the Windward groups, the members of the expeditions amassed sizeable numbers of insects and also some centipedes and millipedes, spiders, scorpions, pseudoscorpions, other arachnids, marine invertebrates, and fishes.

The centipedes collected by the expeditions are particularly valuable, first, because they contribute materially to our knowledge of the poorly known fauna inhabiting an area of great zoogeographical interest. Secondly, as we shall see, the presence of certain centipedes on these islands provides valuable evidence pertinent to the general problem of explaining the biotic affinities linking South America and Africa. Finally, the centipede collection includes four new species and a new genus—all of considerable interest for the characters they display and for their systematic affinities.

I should like to express my gratitude to J. F. G. Clarke of the Smithsonian Institution for capturing and carefully preserving these fragile specimens, and to Mr. and Mrs. J. Bruce Bredin, whose interest and generous support made the expeditions possible.

As fragmentary as it is, our knowledge of neotropical centipedes has seemed to some authorities to provide a measure of support for various theories that postulate a southern intercontinental land connection or continental driftings to explain a number of striking faunal and floral similarities between Africa and South America. Some authorities are impressed with the fact that certain genera, a few higher categories, and some species are known to occur either only in the New World tropics and Africa or in those regions and in Australia-New Zealand. For example, *Schendylurus*, represented in this paper by a new species, has apparently quite similar species in South America and Africa, especially in South Africa. *Scolopocryptops* (formerly *Otocryptops*) *ferruginea* (Linné), a widespread West Indian cryptopid, seems also common in Africa. For additional detailed information the reader is referred to Attems (1926 and 1928) and to a recent, informative account of Turk (1955).

Verhoeff (1941) appeared to subscribe to the idea of a direct southern land route of dispersal, whereas his contemporary, Attems (1928, p. 20), adopting what seems to me to be a less extreme viewpoint, suggested that: "To explain this distribution we need not recur to the theory of continental bridges [or] a Brazilo-African continent; the dispersal took place on the curve [from] South Africa [to] India, with a branching off on one side on the Sunda Archipelago to Australia, on the other side by Eastern Asia to America. Later on the genera died out again on the large part of this curve."

Turk (1955), impressed with the heterogeneity as well as with the farflung affinities of neotropical centipedes, proposed not one but several explanations to account for the different faunal components. Some genera, like *Schendylurus* and *Otocryptops* (= *Scolopocryptops*), he believed, are very old and represent an ancient adaptive radiation that took place possibly in Mesozoic times. This explanation is essentially Attems' viewpoint. A second component, typified by *Ribautia* and *Schizoribautia*, he believed may have arisen in the remote past and then spread from a neotropical center to West Africa across a connecting landbridge sometime during the Eocene-Miocene. Finally he recognized a third (p. 499) component whose distributious "follow somewhat suspiciously closely the direction of the Peru Current and South Equatorial Current," and did not discount the possibility that rafting transported if not the adults then conceivably the hardier eggs from one land mass to another.

I shall comment briefly upon each of these possibilities. Abundant distributional evidence supports the contention that extensive and probably rather regular exchange of chilopods occurred between Asia and North America. Traffic in both directions must have taken place during Tertiary times across the Bering Straits. There is no reason for

supposing that this traffic could not have begun long before those times. This dispersal route extended at each end perhaps best accounts for the presence in Africa, Asia, and South America of a number of the same or of evidently closely related scutigermorph and possibly scolopendromorph genera (or suprageneric groups). Successful rafting, especially by Scutigermorpha and probably also by Scolopendromorpha, is probably unlikely since these active, foraging surface-dwellers seem poorly adapted for prolonged exposure on the confines of floating debris. It is known that *Scutigera coleoptrata* succumbs rather quickly in salt water.

The idea of a direct land connection, at least since Cretaceous times, is seriously challenged today by geological evidence, though a land connection between the southern continents during and before the Triassic cannot at present be discounted entirely (Darlington, 1957, chap. 10). In any event I suspect that these southern faunal similarities can be better explained on other grounds, namely by artificial introduction, ancient dispersal on land, rafting, and wind transport (see Darlington, 1957, pp. 14-20).

Rafting is of particular interest from the standpoint of the schendylids described here, as we shall see. It used to be said of myriapods and amphibians that they could not tolerate salt water, but we know today that a number of centipedes, notably geophilid and schendylid Geophilomorpha, are able to withstand prolonged submersion. There are some genera whose members are reportedly quite normally encountered on beaches where they inhabit the sand, live in debris, or conceal themselves in mud or under wet stones; some of them have been found below the high tide mark. As a matter of fact, three of the present species, *Caritohallex minyrrhopus*, *Ballophilus riverozi*, and *Schendylurus virgingordae*, were collected in West Indian beach drift, and I have in my possession about a dozen specimens of *Pectiniunguis* (again, Schendylidae) that were discovered in seaweed on the beach of a Florida Key.

Cloudsley-Thompson (1948, pp. 149-152) comments on a number of littoral centipedes, some of which are evidently true halophiles. The cases of *Hydroschendyla submarina* (Grube), a schendylid, and *Strigamia* (formerly *Scolioplanes*) *maritima* (Leach) are especially instructive. *S. submarina*, known from the littoral of Scandinavia, France, England, the Mediterranean, and Bermuda, has in Bermuda been found living among mud and rocks and in honeycombed limestone below the mean high tide mark. Apparently this species subsists upon a variety of small marine animals including polychaete annelids. *H. maritima*, widespread on European coasts, has been found to be able to withstand as many as 30 hours of total submersion in sea water and from 70 to 80 hours in fresh water. Cloudsley-

Thompson cites many other valuable records and includes an extensive bibliography to which the reader is referred for additional information.

Since at least some geophilomorph centipedes can tolerate and may even accept as quite normal limited sea submersion, and since such inactive inhabitants of what might be called the crevice-cranny habitat would probably not be discomfited much or at all in the wood or under the bark of larger floating trees and bushes, it seems quite reasonable to imagine these centipedes capable of successful trans-Atlantic crossings by rafting. Many, perhaps the majority, would perish, but over the almost inconceivably long span of time and in the light of the untold millions of such voyages that were begun, many must have reached land and survived. This theory gains additional support from the fact that the Main Equatorial Current flows up the southwestern African coast to the Gulf of Guinea and across to Brazil, there dividing southward and northward, the latter division eventually passing into the Caribbean to merge with the Gulf Stream. The shortest distance between Africa and South America by this route is only about 2,000 miles and, tests have shown, takes about 12 weeks by rafting.

I suggest that during the immense stretches of time of the past some centipedes—they may very well have been Schendylidae—made the journey successfully, and that this explanation reasonably accounts for the presence in Africa and South America of many, but of course not all, congeneric or conspecific centipedes. Perhaps the remarkable distributions of *Schendylurus* and of some of the ballophilines were established, at least in part, in this manner.

## Order Scolopendromorpha

### Family Scolopendridae

*Scolopendra subspinipes* Leach. One adult, outskirts of Charlestown, Nevis, April 16, 1958. With the exception of the Mediterranean region, this large species is common to the tropics of the world. The nominate variant is apparently found widely in the New World tropics, probably as a result of repeated introductions.

*Scolopendra alternans* Leach. Two juveniles, Indigo Wells, Barbuda, April 26, 1958; one adult, Little Bay, Peter Island, March 30, 1958; one adult, L'eau Garnier, Dominica, March 13, 1956. Apparently restricted to the New World tropics, *alternans* is probably the most common *Scolopendra* in the Caribbean area. It has often been reported from southern peninsular Florida and the adjoining keys, and may be presumed to be established at least on the keys.

*Scolopendra morsitans* Linné. Four specimens, Codrington, Barbuda, April 27, 1956. This species is like *subspinipes* in being widespread in the world tropics, but unlike it in being common in the Mediterranean perimeter.

*Cormocephalus impressus* Porat (?=*guildingii* Newport). Three specimens, Indigo Wells, Barbuda, April 26, 1958. The specimens key out to *impressus* in Attems' monograph (1930, p. 104), but are very likely referable to the earlier Newport name that Attems considered too poorly characterized for inclusion in his revision of the species.

### Family Cryptopidae

*Newportia longitarsis* (Newport). One adult, Little Harbor, Jost van Dyke, April 1, 1958; one adult, Castle Bruce Junction, Dominica, March 24, 1956, in bromeliads. The specimens do not coincide exactly with the synthetic diagnosis presented by Attems (1930, p. 201), but seem sufficiently close to justify the present provisional allocation. The species is probably widespread and common in the Antilles, in Central America, and in northern South America where it has already been reported.

*Scolopocryptops* (formerly *Otocryptops*) *ferruginea* (Linné). Two adults, Castle Bruce, Dominica, March 24, 1956, in bromeliads. Originally described from Africa, the species' name has been applied to presumed conspecific forms in the New World tropics. Whatever its rightful name, the species is evidently quite common in Mexico, southern Central America, throughout the Antilles (and perhaps the West Indies in general), and in northern South America.

## Order Geophilomorpha

### Family Oryidae

*Notiphilides maximiliani* (Humbert and Saussure). Adult female, 87 pedal segments, adult male, 89 pedal segments, Soper's Hole, Tortola, March 31, 1958, in refuse. This species is apparently entirely neotropical; it is also widespread and common. It has been recorded from Mexico and Central America, from the Antilles, and from northern South America.

*Orphnaeus brasiliensis* (Humbert and Saussure). One adult male with 71 pedal segments, Soper's Hole, Tortola, March 31, 1958, in refuse. This striking species is undoubtedly very widespread in the American tropics. It has been recorded from South America from about the Tropic of Capricorn northward in scattered localities, and from Central America. It may be widespread in the West Indies as well. There is some question regarding its specific distinctiveness

from the tropicopolitan *brevilabiatu*s (Newport). For instance Attems regarded them as distinct (1929, p. 112), as did Kraus recently (1957, p. 368). On the other hand Bücherl, who has evidently seen many specimens referable to one or the other from Brazil, considers *brasilianus* a junior synonym of the senior Newport name (1941, p. 354).

## Family Schendylidae

### Subfamily Ballophilinae

*Ballophilus riveroi* Chamberlin?. One adult male with 55 pedal segments, Sea Cow Bay, Tortola, March 26, 1958, from Berlese siftings. The Tortola specimen agrees closely with Professor Chamberlin's original description of *riveroi* (1950, p. 157), but this description seems insufficiently detailed to permit a positive identification with my single specimen. If the two are actually conspecific and in turn congeneric with the Liberian-type species, *clavicornis* Cook, then the West Indian *riveroi*, represented in Puerto Rico and Tortola, and the Peruvian *peruanus* Verhoeff (1941, p. 70) represent the only species of the genus known in the Western Hemisphere at the present time, their congeners having been recorded from Africa and the Indo-Australian region.

### *Caritohallex*, new genus

What little we know now of the Ballophilinae does not justify our speaking very confidently of intergeneric relationships. Indeed we may not even be dealing here with a single evolutionary, i.e., monophyletic, unit. Too little is understood of generic characterization and content, and too little is known of inter- and intra-specific variability. Certain so-called key or diagnostic characters may reasonably be suspected of having undergone evolutionary convergency. In this connection one might cite the ventral pore fields and coxopleural glands, perhaps even the prosternal sclerotic lines as well. Until a great deal more is known and understood, however, these possibilities, as well as the existing ballophiline system, should be regarded as conjectural and provisional.

It is unrealistic to speak here of relationships, though we can speak of resemblances, a concept that is quite different because it does not necessarily imply anything about descent and evolutionary affinity. The underlying key to genera is intended to accomplish no more than single out the various ballophiline genera as we now know them. Its groupings do not necessarily imply anything about community of descent. I am certain that its utility will be short-lived. For the time being, however, it does synthesize what we believe may be meaningful.

With these thoughts in mind one may say that *Caritohallex* falls within that assemblage of genera whose members all lack typical, conspicuously clavate and geniculate antennae. At present all of these genera seem restricted to the New World tropics and subtropics: The majority occur in the Caribbean Islands, Central America, and northern South America, i.e., *Diplothmus*, *Taeniolinum*, *Koenethmus*, *Zygethmus*, *Leptynophilus*, *Carethmus?*, and *Caritohallex*. Within this group the new genus resembles most closely *Koenethmus* Chamberlin (1958, p. 59). In both, the antennae are not clavate or geniculate, prosternal sclerotic lines are totally absent, ventral pore fields are not circular or elliptical, and the ultimate leg tarsus consists of a single article. They differ quite significantly in the absence in *Caritohallex* of any discernible coxopleural pit, gland, or pore. Both the pit and the pore are said to be conspicuous in the Chamberlin genus. According to the presently recognized generic system of the subfamily, this distinction is clearly indicative of supraspecific rank.

Generic diagnosis: Antennae not clavate or attenuate; instead, they are filiform proximally and moniliform distally. Cephalic plate is subrotund, dorsally somewhat domed; prebasal plate well exposed. Clypeus much wider than long, with distinct, complete paraclypeal sutures (see note A, p. 189); with a band of coarser, more sclerotized areolation arching forward anterior to the labrum. Labrum membranous, centrally without teeth, laterally with weak membranous to weakly sclerotic teeth. Mandible with indistinctly divided dentate lamella, the row of simple hyaline teeth overlapping the dentate lamella. First maxillae with two pairs of lappets. Second maxillae medially broadly joined, not sutured; with postmaxillary sclerites (see note B, p. 189); telopodite claw pectinate, at least on ventral edge. Prosternum broad, completely bordered by bulging pleura; without subcondylic sclerotic (i.e., chitin) lines. Articles of prehensorial telopodite without denticles; ungula broad, serrulate. Poison gland extending into the prehensorial segment (see note C, p. 190). Tergites not bisulcate. Sternites with double pore fields divergent and linear, not raised. Ultimate pedal segment without discernible coxopleural glands, pits, or pores. Ultimate leg tarsus consisting of one article; pretarsus represented by a minute acicular bristle. Terminal pores absent.

Type-species: *Caritohallex minyrrhopus*, new species (original designation and monotypic).

The following key to the known ballophiline genera should further clarify the identity of *Caritohallex*:

## Key to the Ballophilina Genera

- 1a. Ventral pore fields, at least on anterior third of body, in one or two subcentral areas varying approximately from circular to elliptical. Ultimate leg tarsus consisting of two articles. Antennae clavate or not. Prosternal sclerotic lines present or not . . . . . 3
- 1b. Ventral pore fields, at least on anterior third of body, not in subcentral circular to elliptical areas, rather in posterior bands or diverging lines. Ultimate leg tarsus consisting of one article. Antennae distally not clavate. Prosternal sclerotic lines absent . . . . . 2
- 2a. Each coxopleuron with one pit and associated pore. The more anterior ventral pore fields each appearing as two narrow transverse bands, on rear sternites becoming a single subcentral transverse band. (Venezuela.)  
**Koenethmus** Chamberlin
- 2b. Each coxopleuron without any pore or pit whatever, and each with no discernible gland. Ventral pore fields of anterior as well as of rear part of body each appearing as a pair of diverging strips or lines, and each consisting of a dozen or fewer pores. (Lesser Antilles.)  
**Caritohallex**, new genus
- 3a. Prosternum without or essentially without sclerotic lines. Ventral pore fields of the more anterior sternites each single . . . . . 4
- 3b. Prosternum with complete or virtually complete sclerotic lines. Ventral pore fields of the more anterior sternites each single or double . . . . . 5
- 4a. Antennae conspicuously clavate, more or less geniculate. (Africa, South America, Asia.) . . . . . **Ballophilus** Cook
- 4b. Antennae not clavate, instead attenuate to a greater or lesser degree. (Antilles, Panama.) See note D, p. 191.  
**Taeniolinum** Pocock, **Leptynophilus** Chamberlin
- 5a. Anterior body pore fields each double. Antennae very slightly or not at all clavate. . . . . 6
- 5b. Anterior body pore fields each single. Antennae varying from heavily clavate to filiform . . . . . 7
- 6a. Each coxopleuron with one gland and associated pore. Ventral pore fields not raised. (Colombia.) . . . . . **Zygethmus** Chamberlin
- 6b. Each coxopleuron with two glands and associated pores. Ventral pore fields on slight prominences. (Panama, Antilles, South America.)  
**Diplothmus** Cook
- 7a. Each coxopleuron with one gland which is heterogenous or homogenous. 8
- 7b. Each coxopleuron with two glands and associated pores, the glands heterogenous or homogenous . . . . . 9
- 8a. Coxopleural gland composite, i.e., heterogenous, with numerous discernible inclusive glands. (Puerto Rico.) . . . . . **Clavophilus** Chamberlin
- 8b. Coxopleural gland homogenous, i.e., without discernible inclusive glands. (Honduras.) . . . . . **Taenophilus** Chamberlin
- 9a. Antennae conspicuously clavate and geniculate. Ventral pore fields of anterior sternites circular or else obviously transversely elliptical . . 10
- 9b. Antennae geniculate but not typically so or decidedly clavate. According to Chamberlin (1941, p. 139): "nearly uniform in diameter from second to eighth articles and then abruptly thickened at the ninth article and from there gradually attenuated to the distal end, the last six articles longer and thicker than the preceding ones." Ventral pore fields circular. (Venezuela.) . . . . . **Carethmus** Chamberlin



10a. Ventral pore fields of anterior sternites each clearly transversely elliptical. (Seychelles, Madagascar, Japan, Pacific area, and Brazil.)

*Thalthybius* Attems

10b. Ventral pore fields of anterior sternites strictly circular. (South and Central America, Mexico, and North America.) . . . *Ityphilus* Cook

*Caritohallex minyrrhopus*, new species

FIGURES 1-6

Holotype, male, USNM 2520, British West Indies, Tortola, Sea Cow Bay, from Berlese sifting of beach debris, March 26, 1958, J. F. G. Clarke.

Total length 10 mm. Pedal segments 39. Color pale whitish yellow throughout; without the green or purplish subsurface pigmentation so characteristic of many ballophilines.

Antennae (see also note E, p. 192): Length, 0.82 mm. Proximal articles filiform, becoming distally moniliform. Proximal six or seven articles sparsely setose, thereafter becoming more setose. Ultimate article with a compact group of 8-10 hyaline spatulate setae on outer surface arising from a shallow depression; special sensory structures (sensilla) not detected on other articles.

Cephalic plate: Length along midline 0.32 mm., greatest width 0.32 mm. Subrotund, including prebasal plate somewhat longer than wide; posterior margin embayed to disclose prebasal plate; dorsal surface domed. Setae very sparse and short. Areolation relatively large and pronounced; without sutures or sulci.

Clypeus (see also note A, p. 189): Wider than long, bulging ventrally. Paraclypeal sutures bowed outward, each relatively wide; each side with a notch at position of transbuccal suture, the latter if present very obscure. Clypeal areas absent. Posteriorly with an arching band of more heavily sclerotized, more deeply colored areolation, which encloses a membranous nonareolate crescentic area continuous (or identical) with the atrophied labrum.

Labrum: Apparently continuous with crescentic membranous area of clypeus. Medial part without trace of teeth, entirely membranous. Each lateral part of the labral arch with about two weakly pigmented teeth, medial to the teeth about two flabby, membranous tooth-shaped lobes, barely distinguishable and almost totally transparent.

Mandible: Dentate lamella evidently very indistinctly divided into three parts, with seven or eight teeth; dentate lamella lying under (in situ posterior to) the row of simple hyaline teeth. Condyle prominent, peglike.

First maxillae: Telopodite distinctly bipartite, with one seta; lappets approximately attaining end of telopodite, hyaline, virtually transparent, not squamulate. Coxosternum not sutured medially, anterior

margin deeply emarginate; its lappets not squamulate, nearly transparent, extremely broad basally.

Second maxillae (see also notes B and F, pp. 189, 193): Weakly areolate, nearly membranous, the two sides very broadly joined. Areolate postmaxillary sclerites present. Each pore opening surrounded by a weak sclerotic rim. Without typical setae, but with setiform sensory points as shown. Telopodite basal article bicondylic; claw pointed, spoon shaped, the ventral edge pectinate, the processes very long and delicate, nearly transparent; dorsal edge not discernibly pectinate, apparently smooth.

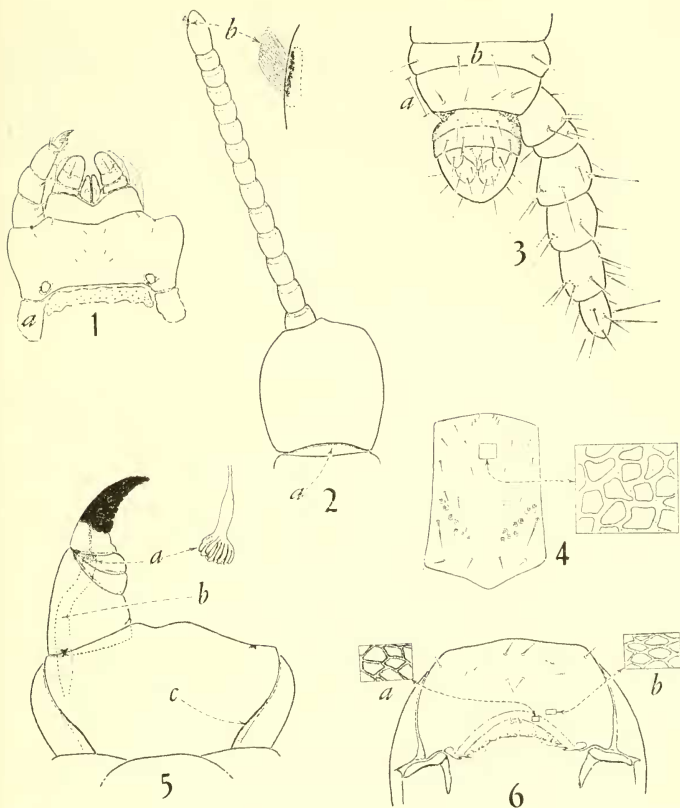
Prehensorial prosternum: Broad and short, margined by bulging pleura. Anteromedially weakly emarginate. Pleuroposternal sutures distinct, otherwise without sutures or apparent sulci.

Prehensorial telopodites (see also note C, p. 190): When closed, not attaining anterior head margin. No article with a denticle. Femuroid and tibioid together bulging toward body midline. Ungula broad and robust; with two distinct edges and a deep groove separating them, the ventral edge dissected to form coarse teeth, the teeth approximately subquadrate, short, five or six in number, limited to the basal two-thirds of blade. Poison calyx spherical, composed of bunched digitiform sclerotic processes. Poison calyx long and thin, terminating in the prehensorial segment at nearly one-half the distance to its posterior border.

Tergites: Apparently not sulcate; sparsely setose.

Sternites: Coarsely, prominently areolate, sparsely setose. Posterior margins, especially of more anterior sternites, extending backward in a broad low triangle; the first 10-15, at least, with a shallow midlongitudinal sulcus. Two pore fields on each sternite from and including the second through the penultimate, each field linear and diverging angularly from its bilateral counterpart, none raised, each consisting of a few small pores (e.g., 2nd=5+5, 4th=8+8, 34th=5+4).

Ultimate pedal segment: Pretergite bilaterally sutured, i.e., delineated from its pleurites on each side by a distinct longitudinal suture. Tergite much broader than long, posterior margin widely bowed backward. Presternite extensive, indistinctly sulcate medially. Sternite very wide and short, sides covering posteriorly. Coxopleuron not greatly swollen, not larger than certain of the leg articles, its axis not directed posteriorly, rather posterolaterally, forming an acute angle with the long body axis; sparsely setose; without pores or pits, and with no discernible glands. Leg with five articles distal to the coxopleuron, the tarsus consisting of one article, the pretarsus represented by a minute acicular bristle (not visible at powers under



FIGURES 1-6.—*Caritohallex minyrrhopus*, new genus, new species, holotype: 1. First and second maxillae (ventral view, left telopodite deleted, all setae shown): *a*, Right postmaxillary sclerite. 2. Cephalic plate (dorsal view, setae deleted), left antenna, prebasal plate: *a*, Prebasal plate; *b*, patch of appressed, spatulate, hyaline setae on terminal article, in situ and enlarged. 3. Ultimate pedal and postpedal segments (ventral view, right leg deleted, all setae shown): *a*, Extent of flat, ventral surface of ultimate pedal sternite; *b*, broad presternite. 4. Sixth pedal sternite (ventral view, major setae shown, anterior end uppermost): Insert shows weak, loosely consolidated areolations of antero-central area. 5. Prehensorial prosternum and right telopodite (ventral view, setae deleted): *a*, Poison calyx, in situ and enlarged; *b*, poison gland; *c*, slightly thickened border of lower part of pleuroprosternal suture. 6. Clypeus, labrum, buccae (ventral view, all setae shown): *a*, Coarse, deep, more strongly sclerotized areolation of arched clypeal band; *b*, contrasting smoother, shallower, weakly sclerotized areolation just anterior to arched band.

100×); leg swollen but evidently not to the degree encountered in some of the other genera; its setae are extremely long and straight.

Post pedal segments: Gonopods apparently unipartite, lobate, well separated. Pregenital sternite not obliquely excised as is usual in the male geophilomorph, instead rather bandlike as in the female. Male intromittent apparatus clearly disclosed lying dorsal and internal to and between the gonopods. Terminal pores absent.

Paratype, apparently female, same collection data. The only other specimen secured is a female (the intromittent apparatus characteristic of the male seems to be absent), 8 mm. long, with 43 pedal segments. The female agrees closely with the foregoing description of the male holotype.

*Ityphilus idanus*, new species

FIGURES 7-12

The two ballophiline genera for which the largest number of species has been recorded are *Ballophilus* and *Ityphilus*. The former is evidently dominant in the Old World tropics, but has at least two known neotropical species, and the latter seems to be represented only in the tropics and possibly subtropics of the New World.

The present species falls clearly within *Ityphilus*, as it is now defined. According to the published descriptions, *guianensis* Chamberlin seems most like *idanus*. They differ as follows: *I. guianensis*: Inner edge of prehensorial blade conspicuously serrulate; ventral pore fields extending to and present on penult pedal segment; posterior coxopleural pores larger than anterior pores. *I. idanus*: Edge of prehensorial blade smooth, not serrulate; ventral pore fields absent on last four pedal sternites; coxopleural pores all essentially equal in size.

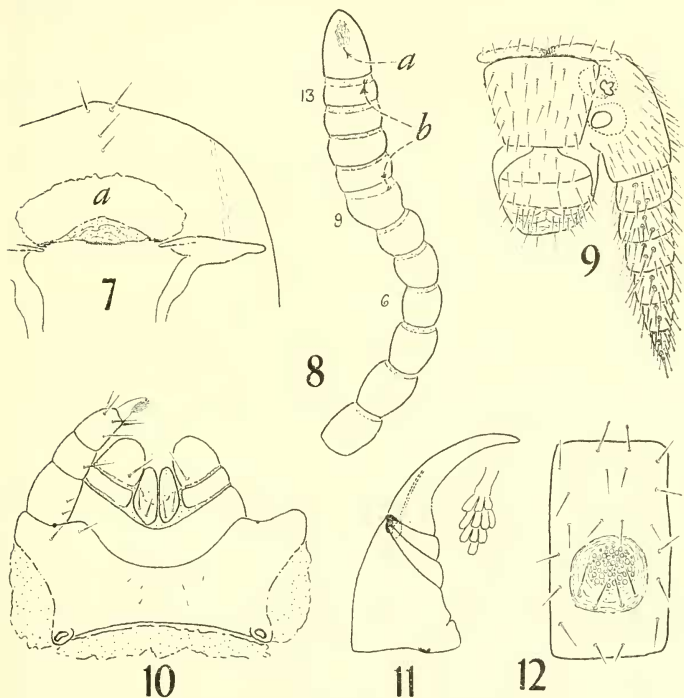
Holotype, female, USNM 2523, British West Indies, Barbuda, Danby Cave, April 28, 1958, J. F. G. Clarke, collector, in Berlese siftings.

Length 18 mm. Pedal segments 59. Body weakly, gradually attenuate anteriorly, the head suddenly enlarged giving the region just behind it a necklike appearance. Antennae, head, prehensors, and prosternum light yellowish brown; tergites, pleurites, sternites, legs with underlying fleshy parts dilute sordid green, the ventral pore fields dark sordid green.

Antennae (see notes E and G, pp. 192, 193): Length 0.6 mm. Distally clavate and geniculate. Articles 2-6 filiform, longer than wide, 7-9 cup-shaped and expanding distally, 10-14 very broad and short, as a group clavate, ventrally somewhat flattened and very densely, minutely setose (in contrast with sparser vestiture of rest of antenna). Ultimate article on each side with a slight pit containing about a

dozen hyaline, spatulate setae. Articles 9 and 13 each dorsodistally with two short thick, deeply colored sensory points (sensilla).

Cephalic plate: Length 0.34 mm., greatest width 0.38 mm. In outline nearly circular, dorsally swollen into a low dome. Setae very sparse and long. Deeply areolate and shining. Without sutures or sulci. Prebasal plate not apparent, evidently vestigial or absent.



FIGURES 7-12.—*Ityphilus idanus*, new species, holotype: 7. Clypeus and labrum (ventral view, all setae shown): *a*, Arching band of heavier, more deeply colored areolation enclosing strictly membranous region just anterior to degenerate labrum. 8. Right antenna (lateral aspect, the ventral surface is on left, all setae deleted, all but first two articles shown): *a*, Elliptical patch of hyaline spatulate setae on terminal article; *b*, peglike or pointlike sensilla on articles 9 and 13. 9. Ultimate pedal and postpedal segments (ventral view, right leg deleted): All setae of presternites, sternite, and ultimate leg shown. 10. First and second maxillae (ventral view, left telopodite deleted, all setae shown on right side): The membrane is indicated by stippling. 11. Right prehensorial telopodite (ventral view, all setae deleted): Poison calyx in situ and enlarged. 12. Sixth sternite (ventral view, all setae shown): Anterior end uppermost.

Clypeus (see also notes A and H, pp. 189, 193): As a whole swollen ventrally; much broader than long; paraclypeal sutures present but extremely vague, detected with difficulty; transbuccal sutures apparently absent. Without clypeal areas. Anterior to labral position a broad arc of more strongly sclerotized and deeply colored areolation, the remainder of the clypeus anterior to arc very weakly areolate; the part posterior to and enclosed by the arc membranous, not areolate. With two postantennal setae and two more setae just posterior to these; without posterior geminate setae.

Labrum: Centrally membranous, with a fringe of minute hairlike structures; each side of the labrum with one or two weak, poorly developed obscure teeth.

Mandible: Dentate lamella undivided, teeth blunt, well-separated, eight in number. With about 13 simple, hyaline teeth, their row overlapping two-thirds of the dentate lamella.

First maxillae: Telopodite distinctly bipartite, with one seta, without lappets. Coxosternum without medial suture or indication of division; coarsely areolate; without lappets.

Second maxillae (see also notes B and F, pp. 189, 193): Isthmus very broad, without suture or indication of division; areolation weak but uniform. Each coxosternite laterally membranous; entirely without postmaxillary sclerites; each pore opening somewhat thickened; with short laterally disposed setae and short sensory pegs medially. Telopodite basally bicondylic; apical claw spoon shaped, pointed, pectinate on each edge.

Prehensorial prosternum: Laterally broadly bordered by the swollen pleura. With prominent subcondylic sclerotic lines. Without sutures or apparent sulci; very sparsely setose.

Prehensorial telopodite (see also note C, p. 190): No article with a denticle. Ungula thin, acuminate, dilute in color, inner edge smooth. Poison calyx with a cluster of digitiform sclerotic appendages. Poison gland very long, extending into the prehensorial segment.

Tergites: Basal plate not covered by the cephalic, without sutures or sulci. Tergites 2 through the penultimate each very shallowly bisulcate. Setae relatively robust and dark. Surface coarsely areolate.

Sternites: Posteriorly without a broad triangular extension; on about the anterior third of the body each is slightly indented anteriorly. Setae long, robust, dark. Approximately the first 15 each with a short midlongitudinal depression. Pore fields on a circular, raised prominence, each with 4 long setae on the more anterior sternites, decreasing to 2 setae on the rear sternites; pore fields present on sternites 2 through 55, the last 4 pedal sternites without pore fields or discernible pores.

Ultimate pedal segment: Pretergite suturate on each side, delineated from its pleurites by pronounced longitudinal sutures. Tergite subtriangular, the rear margin narrowly rounded, laterally leaving much of coxopleura exposed from above. Presternite distinctly divided medially. Sternite sides straight, posteriorly truncate; greatest width somewhat greater than greatest length. Each coxopleuron with two pores and associated glands, the former exposed ventrally (not wholly covered by the sternite), the glands are of the homogenous type (i.e., lack inclusive smaller glands). Each leg with six articles distal to the coxopleuron; as a whole evenly attenuate, robust, swollen; pretarsus represented by a long, straight, setiform structure.

Postpedal segments: Gonopods consisting each of one article, medially imperfectly separated. Terminal pores absent.

Paratypes: One male, 13 mm., 55 pedal segments; one male, 9 mm., 55 pedal segments. See collection data for holotype. The two paratypes agree closely with the description of the holotype above.

### Subfamily Schendylinae

#### *Schendylurus virgingordae*, new species

FIGURE 13-17

The new species belongs to that division of *Schendylurus* whose species possess: (1) Undivided pore fields, but only on the more anterior sternites; (2) a distinctly divided mandibular dentate lamella; (3) two pairs of well developed maxillary lappets. On the basis of published descriptions *S. virgingordae* seems most like the African *S. polyypus* Attems and *S. australis* Silvestri, and the Peruvian *S. montivagus* Turk—if the latter possesses first maxillary lappets, a condition that is not clarified in Turk's original description. Aside from the question of lappets, Turk's species differs from *virgingordae* as follows: *S. montivagus*: Mandibular dentate lamella divided into four blocks; labrum with 37 teeth; ultimate pretarsus is evidently a distinct fleshy eminence; first two pedal sternites without pore fields; pore fields subelliptical. *S. virgingordae*: Mandibular dentate lamella divided into three blocks; labrum with less than 20 teeth; ultimate pedal pretarsus not tuberculate, represented only by an acicular bristle; second pedal sternite with a large pore field, the latter and succeeding pore fields distinctly subtriangular, each with a prominent posterior apex. *S. virgingordae* resembles *australis* rather closely except for the lack of first maxillary lappets in the African form. Attems' *polyypus* differs from *virgingordae* in the former's abruptly narrowed ultimate pedal second tarsus, peculiarly shaped pore fields, number of pedal segments, mandibular divisions, and deeply embayed labrum.

Holotype, female, USNM 2522, British West Indies, Virgin Gorda, Prickly Pear Island, March 29, 1958, J. F. G. Clarke, collector, Berlese samplings of beach drift.

Body length 20 mm. Pedal segments 53. Color head prehensorial segment, and antennae pale yellow; pleura, tergites, sternites, and legs yellowish white to white or colorless.

Antennae (see also note E, p. 192): Length 216 mm. Filiform, each article much longer than wide (e.g., seventh,  $l:w=40:24$ ). First 7 articles less setose than 8-14. Ultimate article at tip on outside with a long groove in which are 10-12 hyaline, spatulate setae; without any other apparent special sensilla on this article or the other articles.

Cephalic plate: Length 0.75 mm., greatest width 0.57 mm. Sides slightly bowed outward, barely converging posteriorly; posterior margin straight. Dorsal setae few and small but lateral setae dense and short. Without a typical frontal suture. Anterior two-fifths of plate coarsely areolate, posterior portion except for two paramedian obsolete lines (appearing as sulci) smooth, the areolations more or less consolidated. Prebasal plate not apparent.

Clypeus (see also note A, p. 189): Paraclypeal sutures prominent; transbuccal sutures apparently absent. Without clypeal areas, without area of areolate consolidation except at extreme corners of labrum. Setae relatively short, thick, straight, dark. Each bucca shortly densely setose as shown.

Labrum: Evenly slightly embayed; medially separated from clypeus by a narrow membranous strip. Teeth all strong, dark; medial 6 apically blunt and flanked by more pointed teeth, the first kind merging almost imperceptibly into the other, the whole labral edge with 17-18 teeth.

Mandible: Dentate lamella in three distinct, well separated blocks, each with well separated, pointed teeth, right 3-3-2, left 3-3-3. The simple row of hyaline teeth not overlapping the dentate lamella.

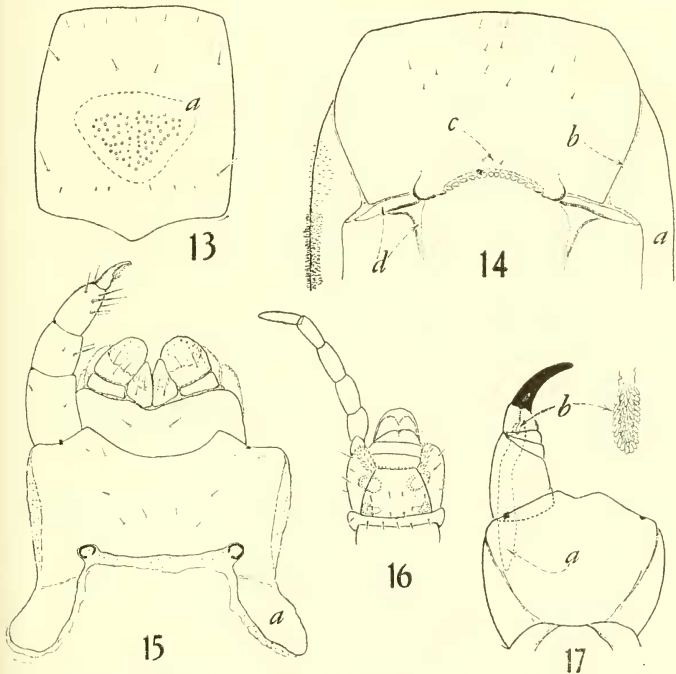
First maxillae: Telopodite distinctly bipartite, each with two or three setae. Coxosternum without medial suture; with only two setae; lappets vague, short, their surfaces subsquamulate, rather broad.

Second maxillae: Medially wide, without indication of division. With prominent postmaxillary sclerites completely fused with coxosternites. Pore opening slightly raised and sclerotized. Telopodite basal article bicondylic. Claw long, pointed, spoon shaped, each edge pectinate, the teeth of the ventral edge short, of dorsal edge long and hyaline.

Prehensorial prosternum: Anteriorly broadly diastemate but not denticulate. With a shallow midlongitudinal sulcus very regularly areolate. Each pleuroprosternal suture margined for half its length by a slight ridge (an abortive chitin or sclerotic line?).



Prehensorial telopodite (see also note C, p. 190): Failing to surpass front margin of head. No article with distinct denticles, though tarsungula with broad, rounded, slightly more sclerotized, light colored, very low eminence. Ungular inner edge perfectly smooth, not serrulate. Poison calyx elongate, its digitiform appendices relatively short. Poison gland thin and very long, passing out of prehensor well into prehensorial segment.



FIGURES 13-17.—*Schendylurus virgingordae*, new species, holotype: 13. Sixth pedal sternite (ventral view, anterior end uppermost, major setae shown): *a*, Dashed line indicating extent of smoothly, weakly areolate area around pore field; remainder is more coarsely, deeply areolate. 14. Clypeus, labrum, buccae (ventral view, all setae shown except on left bucca): *a*, Left bucca; *b*, left paraclypeal suture; *c*, posterior geminate setae; *d*, right futura (*Komandibulares* Gerüst). 15. First and second maxillae (ventral view, left telopodite deleted, all setae shown): *a*, Left postmaxillary sclerite fused to left coxosternite. 16. Ultimate pedal and postpedal segments, right leg deleted. All setae of ultimate pedal presternite, sternite and of coxopleuron shown; others deleted. 17. Prehensorial prosthema and right telopodite (ventral view, all setae deleted): *a*, End of poison gland extending back into prehensorial segment; *b*, poison calyx in situ and enlarged.

Tergites: Basal plate slightly narrowing anteriorly, sides straight; not saturate or sulcate. Remaining tergites (except ultimate pedal) distinctly bisulcate. Very sparsely setose.

Sternites: Excluding ultimate pedal sternite each sternite very sparsely setose; each coarsely areolate except for area of smoother areolation surrounding each pore field. On anterior third of body each sternite posteriorly extended in a broad low triangle, the extension interlocking with intersternite and succeeding sternite. Pore fields single, subcentral, subtriangular, from sternite 2 through 20-22, the following sternites without pore fields and apparently without pores.

Ultimate pedal segment: Pretergite distinctly saturate laterally, thereby delineated from its pleurites. Tergite very broad, the greatest width greater than the greatest length; sides slightly incurved, posterior edge straight and about two-thirds the width of the anterior edge; exposing all but the anterior quarter of each coxopleuron from above; with a few very long setae. Presternite medially vaguely saturate, fused laterally with pleurites. Sternite broadly trapezoidal, sides slightly curving and convergent; posteriorly broadly truncate. Each coxopleuron moderately swollen; laterally with a few very long setae, ventroposterior surface with a dense vestiture of short setae; glands homogenous, two per coxopleuron, posterior pores and glands somewhat larger than the anterior. Legs each with six articles distal to coxopleuron, tarsus having two articles, each with a few very long setae in circlets; prefemur, femur, and tibia ventrally with subdense short setae concentrated about as on coxopleuron; pretarsus represented only by a minute acicular bristle about one-eighth as long as the largest neighboring setae.

Postpedal segments: Gonopods broad, medially fused, each apparently of one segment. Terminal pores absent.

## Family Geophilidae

### Subfamily Chilenophilinae

#### *Lestophilus bredini*, new species

FIGURES 18-24

All the species of *Lestophilus* known to date occur in Mexico and the two Antillean Islands Hispaniola and Tortola. Further collection is likely to disclose the presence both of described and of new congeners throughout much of the West Indies, as well as in Central America, and possibly in northern South America.

Unlike some of the supraspecific groupings of circum-Caribbean chilenophilines, *Lestophilus* seems quite consistent internally. Its few species share a convincing combination of apparently homologous characters, the most useful of which appear to be the following:

(1) First maxillae with long lappets. (2) Second maxillae with pronounced statumina (note I, p.194), a poreopening being medial to the statumina. (3) Second maxillary coxosternites joined by a rather broad but flimsy, membranous, medially very weakly areolate isthmus. There is no medial, dark, well sclerotized, knoblike anterior projection (the medial chitinous projection of Chamberlin) as there is in *Nesidiphilus*; nor is there encountered the thin, rather blisterlike isthmus of the more northern *Arctogeophilus*. (4) Postmaxillary sclerites are very small, strictly posterior in position. In certain other genera, such as Chamberlin's *Nesidiphilus* and *Suturodes*, the sclerites are broad and extend well up to or toward the poreopening. (5) Labrum tripartite, the midpiece not at all overlapped by or dorsoposterior to the sidepieces. (6) Ultimate tarsus of two articles. (7) Ultimate pretarsus reportedly absent (Chamberlin, 1915, p. 523) but probably, as in *bredini*, represented in some or in all by a minute, terminal, acicular bristle or point.

The new species differs strikingly from all others in its possession on each of the more anterior body sternites of a single, undivided, roughly diamond-shaped, subcentral pore field. In all others this pore field assumes the shape of a transverse band. *L. bredini* seems most like *L. haitiensis* Chamberlin; each has a pedal number in the high fifties and a serrulate prehensorial blade. The difference in pore fields shape (diamond-shaped to subtriangular in *bredini* but bandlike in *haitiensis*) should serve to separate the two quite readily.

Holotype: Female, USNM 2521, British West Indies, Tortola, Sea Cow Bay, March 26, 1958, J. F. G. Clarke, collector, Berlese samples of beach drift.

Length 21 mm. Pedal segments 59. Color of head, antennae, prehensorial segment light brownish yellow; pleurites, legs, sternites, tergites very pale yellowish to translucent or colorless.

Antennae: Length 2.7 mm. Each article much longer than wide; the whole essentially filiform. Basal six articles each with two distinct circlets of long setae, otherwise very sparsely setose; remaining articles each with progressively shorter but more numerous setae. Ultimate article about 30 percent longer than the penultimate; the ultimate subapically with 2 shallow elongate depressions on opposing sides, each depression containing spatulate hyaline setae,  $90^\circ$  from each and at the same level an elongate patch of 8-15 hyaline spatulate setae (i.e., with 4 patches of setae in all, each  $90^\circ$  from the next).

Cephalic plate: Length 0.75 mm., greatest width 0.48 mm. Elongate, sides subparallel; anteriorly and posteriorly narrowed. Sparsely setose, with a few very long, conspicuous fringing setae. Frontal sulcus appears (as seen by transmitted light) as a curved strip of much coarser, more translucent areolation; with two prominent

paramedian sulci extending forward to the frontal sulcus. Prebasal plate not apparent.

Clypeus (see also notes A and H, pp. 189, 193): Paraclypeal sutures pronounced and complete; clypeus somewhat wider than long. Each bucca anteriorly traversed by a distinct, oblique transbuccal suture. With two clypeal areas, each very small and subcircular, contiguous with the alveoli [of the most anterior setae, and containing minute sclerotic fragments (and pores?). Otherwise clypeus uniformly, coarsely areolate, without smooth areas. All setae as shown, short and robust, deeply colored; anteriorly with four setae; posterior geminate setae about one-third the distance from labrum to anterior clypeal margin.

Labrum: Distinctly tripartite; separated from clypeus by a thin membranous strip. Midpiece deeply colored; with six strong teeth. Each sidepiece with a series of long acicular hyaline fimbriae on its medial half. Each futura well sclerotized and large.

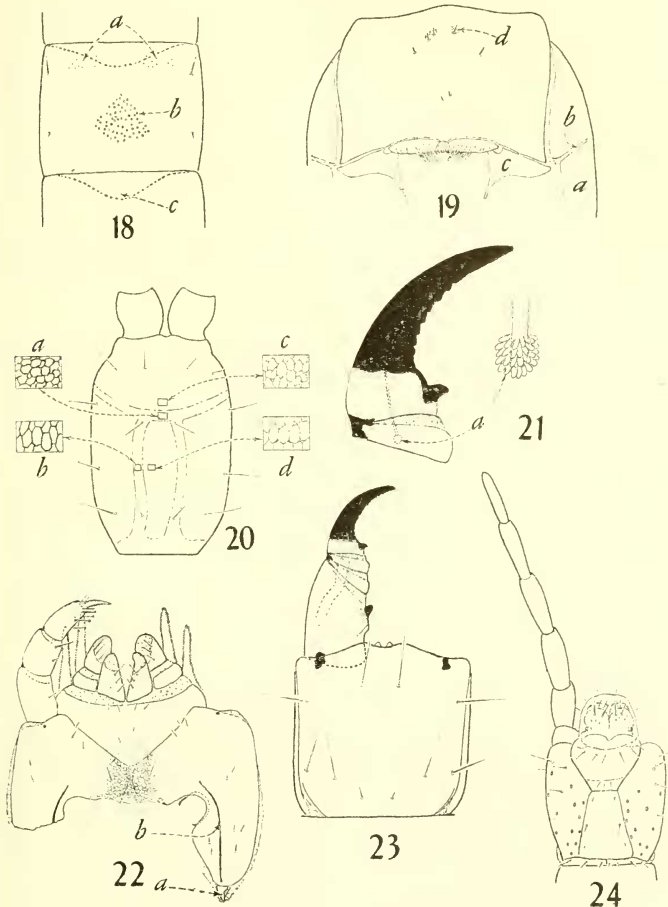
Prehensorial prosternum: Somewhat longer than wide; sides parallel; anteriorly medially not diastemate, with two short denticular projections. With a very shallow midlongitudinal depression. Surface smoothly areolate; with eight very long setae, surface uniformly clothed with numerous minute, short sensory points (minute, short setae). Pleuroprosternal sutures complete anteriorly; sclerotic (chitin) lines abortive, in essence absent.

Prosternal telopodite (see also note C, p. 190): When closed extending well beyond cephalic frontal margin. Trochanteroprefemur with a large dark, distomesal denticle, the article conspicuously excavated just below denticle. Femuroid and tibioid without denticles. Tarsungular denticle slightly smaller than those of basal article, the end somewhat deflected, thumb shaped. Ungula falciform, robust, dark, evenly gradually curved; proximal two-thirds of its blade coarsely serrulate. Poison calyx short, broad, subcordiform in outline, its

FIGURES 18-24.—*Lestophilus bredini*, new species, holotype: 18. Sixth sternite (ventral view, anterior end uppermost, major setae shown): *a*, Anterior bilateral (paired) pore fields; *b*, diamond-shaped subcentral pore field; *c*, broad triangular extension (metasternite) of sixth sternite. 19. Clypeus, labrum bucca (ventral view, all setae shown): *a*, Left bucca; *b*, transbuccal suture; *c*, left futura (*Komandibulares* Gerüst); *d*, tiny clypeal area just anterior to seta. 20. Cephalic plate (dorsal view, major setae shown): *a*, Coarse, deep areolation of frontal sulcus; *b*, coarse, deep areolation of right paramedian suture; *c*, smoother, shallower areolation of frontal plate; *d*, smoother, shallower areolation of area between paramedian cephalic sulci. 21. Right tarsungula and right tibioid (ventral view, setae deleted): *a*, Poison calyx, in situ and enlarged. 22. First and second maxillae (ventral view, all setae shown): *a*, Minute, postmaxillary sclerite; *b*, left statumen. 23. Prehensorial prosternum and telopodite (ventral view): All major prosternal setae shown; setae of telopodite deleted. 24. Ultimate pedal and postpedal segments, left leg (ventral view): Setae of leg deleted; all others shown.

digitiform appendices numerous and individually well delineated. Poison gland long and thin, deflected outward; its lower end reaching to level of trochanteroprefemoral excavation, not extending into the prehensorial segment.

Mandible: Of the usual geophiloid form; with about 20 simple hyaline teeth, none strongly sclerotized; condyle well developed.



(For explanation see opposite page.)

First maxillae: Telopodites distinctly bipartite, each telopodite with three setae; with an extremely long and conspicuously squamulate, thin, acuminate lappet. Medial projection subtriangular, with three setae. Coxosternum without medial division, sparsely setose; its lappets extremely long, acuminate, thin, squamulate.

Second maxillae (see also notes B, I, F, pp. 189, 193, 194): Isthmus very weak, markedly areolate and membranous, the two coxosternites appearing (though not actually) separated. Each coxosternite anteroposteriorly relatively short; each with a small postmaxillary sclerite at the posterior angle. Each statumen strongly sclerotic, dark, arching ectal to and partly around its associated pore, the pore relatively large, opening widely medially. Coxosternal setae as shown. Telopodite first article bicondylic; inner surface of article basally swollen. No article with sclerotic projections or other appendances. Apical claw very long and thin.

Tergites, except ultimate pedal: Basal plate not bisulcate; slightly overlapped by posterior edge of cephalic plate. Pedal tergites markedly bisulcate, sparsely setose, the lateral margins of each with one very long seta.

Sternites, except ultimate pedal: Very sparsely setose, the setae short; faintly areolate; smooth, shining. Sternites of about the anterior third of the body each with a broad, unconsolidated and membranous (and areolate) posterior triangular extension. Each sternite except the first with a deep midlongitudinal sulcus, the sulcus becoming shallower on posterior sternites. Pore fields of 2 kinds: central or subcentral, on sternites 2 through 56; the pore fields on anterior third of body diamond shaped to subtriangular, their apices forward, thereafter becoming progressively wider and longer, more elliptical (the axes anteroposterior) and extending toward the rear border of the mesosternite; anterior paired pore fields on sternites 2 through at least 30, apparently absent on rear third of body, the pore fields extremely vague, their pores minute and pale, hence readily overlooked.

Ultimate pedal segment: Pretergite without lateral sutures, i.e., not demarcated from its pleurites. Tergite with sides weakly converging to the broad, truncate posterior margin, exposing dorsolateral parts of each coxopleuron; sparsely setose. Sternite trapezoidal, sides and rear margin straight; much longer than wide. Presternite medially vaguely sutured; fused on each side without demarcation from pleurites. Coxopleura each with about 20 (left 22, right 19) small pores; moderately swollen, extending forward at least to penultimate pedal segment, sparsely setose; without special lobes or ridges. Ultimate leg long and thin, with six articles distal to coxopleuron, the tarsus consisting of two articles, the pretarsus represented by a short,

thick acicular bristle, the bristle not setiform; each article of leg clothed with a small number of long pale setae.

Postpedal segments: Gonopods flat, broad, membranous, fused and indented medially, without sutures, apparently unipartite. Terminal pores present, distinct.

### Notes

NOTE A, PARACLYPEAL SUTURES AND BUCCAE: Heretofore ignored in systematic discussions are what I term here the "paraclypeal sutures." When present and fully developed, they delineate the clypeus laterally; arising in the antennal sockets, they pass laterally and then posteriorly to end usually just ectal to the outer end of each labral sidepiece. They have been observed in various states of development and configuration in numerous geophilomorph genera; in some they appear to be absent, probably following degeneration. For example, in *Ityphilus idanus* they are extremely vague, whereas in *Schendylurus virgingordae* they are prominent. In general their presence or absence, their degree of development, and their shape and route promise to be useful as diagnostic characters.

The paraclypeal sutures, when present, separate the clypeus on each side from the deflected, ventral extensions of the dorsal cephalic plate. In other words, these ventrally deflected surfaces represent the continuations of each side of the cephalic capsule. They have been termed by many authors the cephalic pleura; however, their morphological identity is by no means so clear. Consequently it seems both premature and misleading to homologize each with a segmental pleuron. Therefore, I propose that the term "bucca" (cheek, pl. "buccae") be applied to them instead. Bucca is descriptive without having basic morphological implications. Each bucca, then, is that ventrally deflected part of the cephalic capsule that attaches posteriorly to the maxillae and that is anteriorly continuous with the clypeus from which it is often demarcated by a paraclypeal suture.

The bucca is sometimes traversed just posterior to the rear limit of the clypeus by an oblique suture, here designated the transbuccal suture. When present, this suture usually begins in the vicinity of the rear terminus of the associated paraclypeal suture, and then passes laterally or anterolaterally to terminate on the lateral edge of the bucca. In some genera the transbuccal suture seems to be continuous with the dorsally lying frontal suture. A transbuccal suture has been found to be present in many Geophilomorpha and absent in many others. Its origin and termination, degree of development, and configuration seem useful as classificatory devices, especially at supraspecific levels.

NOTE B, POSTMAXILLARY SCLERITES: In many schendylid and geophilid (sensu lato) centipedes, authors have recognized and made

extensive systematic use of some sclerites lying just posterior or posteromedial to the second maxillary coxosternites. By Ribaut, Broelemann, Attems, and others they have been termed the maxillary pleurites. Their shape, position, and degree of development and their presence or absence have distinct systematic significance. They seem to represent, at least in part, variously sclerotized portions of the membrane that connects the maxillae with the prehensorial segment lying to the rear. They are probably not parts of the primitive second maxillae at all, though there is evidence in some genera, e.g., *Arctogeophilus* and probably some geophilines, that they have been incorporated secondarily into the definitive second maxillary coxosternites. Since their basic morphological identity is unclear, and since in any event the evidence suggests they are not entirely or possibly not at all pleural in origin, it seems preferable to apply to them some other, simply descriptive term—one without morphological implications or inferences of homology. For this reason I propose that they be called postmaxillary sclerites.

NOTE C, PREHENSORIAL POISON APPARATUS: Apparently the first person to recognize the sclerotized poison calyx as a valuable diagnostic adjunct was Verhoeff, who utilized it in several studies of the genus *Strigamia* (*Scolioplanes*, and *Linotaenia* of authors). The shape and position of the calyx is apparently quite constant for the species. Having investigated such characters quite carefully, I find them to be of considerable utility, for instance, in distinguishing between closely similar but different congeneric species. The calyx is located at the anterior end of the poison gland, presumably drains it, and releases the venom to the poison canal.

Though he made effective use of the poison calyx, Verhoeff overlooked the poison gland as a source of classificatory information. My own study of the poison gland is still in the initial stages; however, it seems clear that the gland can often provide valuable auxiliary clues to identity at all levels from the specific to the familial.

Generally speaking, the degree of development or size of the poison gland seems inversely proportional to the development of the prehensorial telopodite as a whole. When the prehensor is large and ponderous (in some chilcnophilines and mecistocephalids), the gland is often quite small and is restricted entirely to the body of the prehensor itself. Conversely, when the prehensor is tiny and fragile (in some ballophilines and geophilines), the gland is relatively extensive and often passes from the telopodite back into the associated prehensorial segment. I have observed exceptions to both rules, but in the main this inverse relationship seems widespread.

Both the calyx and the attached gland are readily seen if the whole prehensorial segment with telopodite attached are mounted in Hoyer's



fluid or, following thorough dehydration in alcohol, in Canada balsam. Treatment with KOH or NaOH is apt to distort the position and shape of the calyx and of course will destroy the fleshy gland.

NOTE D: Heretofore our only source of knowledge of *Taeniolinum* was Pocock's superficial and in some ways misleading original description (1893, pp. 471-472). The following brief diagnoses are based upon the recent examination of one of the two original cotypes, for whose loan I am indebted to G. Owen Evans of the British Museum of Natural History.

*Taeniolinum* Pocock

Generic diagnosis: Antennae not clavate nor geniculate; neither are they conspicuously attenuate. Labral teeth well developed and numerous; labrum weakly arched. First maxillary telopodite lappets long and robust; coxosternal lappets evidently absent. Second maxillary claw bipectinate. Prosternal sclerotic lines not apparent, i.e. not passing to or toward the prehensorial condyles. Tergites not sulcate. Each sternite from one through the penultimate bears a distinct pore field; no pore field raised or divided; pore fields of anterior third of body distinctly and transversely elliptical. Each coxopleuron has two essentially round and concealed pores; each pore is associated with a homogenous gland. Each ultimate leg is swollen and strongly, evenly attenuate distally; ultimate tarsus consisting of two articles; pretarsus is distinct and tuberculate.

*Taeniolinum setosum* Pocock

Species diagnosis: Male cotype, British West Indies, St. Vincent Island, collected at 3,000 ft. in moss on a mountain by H. H. Smith. Total length about 13 mm.; with 49 pairs of legs. Antennae neither clavate nor geniculate; distal half very weakly attenuate (the whole structure strongly contracted); articles 6-14 densely setose; each article but the 14th much broader than long. Cephalic plate slightly longer than wide; sides weakly rounded; rear margin straight and very slightly overlapped by succeeding plate. Clypeus without a typical clypeal area, in its position a subcircular field of minute pores; paraclypeal sutures pronounced; transbuccal sutures very vague; posterior margin straight, deeply pigmented and well sclerotized. Labrum very wide and weakly arched, nearly straight; the entire posterior margin with about 32 prominent, strong but pale teeth. Mandible with the undivided dentate lamella evidently having 6 strong, widely separated teeth. First maxillae without medial division; medial lobes long and triangular, lappets of coxosternum apparently absent; each telopodite indistinctly separated from coxosternum and indistinctly biarticulate, with a robust lappet equaling

the medial lobe in length. Second maxillae with postmaxillary sclerites not detected; pore entirely enclosed; isthmus broad and not sulcate or suturate; telopodite normal, claw distally spoon shaped with two finely pectinate edges. Prehensors having no article with denticles; ungula strongly curved over its distal third; poison calyx subcordiform; poison gland passing out of the prehensor posteriorly. Prosternum without sclerotic lines; anterior diastema broadly rounded and shallow, without denticles. Tergites not suturate. Sternites each much longer than wide, the majority weakly mediosulcate; pore fields of anterior third of body distinct but not raised, each subcentral and transversely subelliptical; on last third of body each pore field appears as a transverse single line of pores; sternites one through the penultimate with undivided pore fields. Ultimate pedal segment having pretergite laterally separated from its pleurites by weak sutures, the tergite posteriorly rounded and much broader than long; presternite broad and bandlike, medially weakly suturate or sulcate; sternite is trapezoidal, sides and rear margin straight, greatest length slightly greater than width at midlength; coxopleuron with two homogenous glands, each gland with one subcircular concealed pore; each leg greatly swollen and distally strongly attenuate, clothed with numerous stiff setae, with two tarsal articles and a tiny tuberculate pretarsus. Postpedal segments with short uniarticulate gonopods widely separated; terminal pores absent.

From the foregoing summary descriptions, it is apparent that *Leptynophilus* Chamberlin (1940, pp. 69-70) may be a junior synonym of the Pocock genus, although the original description of *Leptynophilus* is not sufficiently detailed or complete to permit a positive decision in the matter. In any event, I am unable at this time to find convincing grounds in Chamberlin's description for a generic separation of *T. setosum* from *L. mundus*, the two type species.

*T. panamicum* (1940, p. 69) is evidently a true *Taeniolum*, although its original description does not show how it differs from *setosum*, if indeed the two species are not conspecific.

NOTE E, ANTENNAL SETAE AND SPECIAL SENSILLA: In general there are three kinds of setae that invest the antenna: (1) Typical setae occur generally over the surface of the antenna and vary from short and thin to quite long and thin. All are pale in color, movably affixed to distinct sockets (alveoli), and do not occur in special, restricted patches. These setae are evidently concerned with the reception of tactile environmental stimuli. (2) Hyaline spatulate setae occur in distinct patches and are restricted to certain areas of certain articles. These setae are very pale to translucent in color and arise either from vague, degenerate alveoli, or else appear not to be alveolate at all. In *Caritohallex minyrrhopus*, these setae are

restricted to a small area of the outer surface of the 14th article, but in *Ityphilus idanus* they occur on the outer as well as on the inner surfaces of the 14th article. Their appearance and possibly their position suggest a chemoreceptive function. (3) Sensory points, or sensilla, like the spatulate setae, occur in patches and quite constantly (at least intraspecifically) in the same positions on the same articles. These sensilla are distinctive in being very darkly colored, very short and robust, and indistinctly or not at all alveolate. Apparently they have lost much or all of the mobility that is typical of ordinary setae. I have observed such sensilla in many Geophilomorpha. Some of these points are probably responsive to environmental stimuli, but the positions of others suggest a possible proprioceptive role; that is, they may be positioned such that the movement of one antennal article against another would stimulate them, and this condition may well be concerned with supplying information pertinent to the position in space of the whole antenna, or of individual articles, or of groups of articles.

NOTE F, A NEW MAXILLARY CHARACTER: "Bicondylic" is a new term that I introduce in reference to the two condyles (one dorsal and one ventral) whereby the basal telopodite article is articulated with the second maxillary coxosternite. Evidently it has been overlooked that though there are usually two such condyles, in some genera there is only one. For instance, throughout the Holarctic genus *Arctogeophilus* there is, to the best of my knowledge, never more than one nodular condyle, the dorsal one, the ventral one having degenerated and vanished completely.

NOTE G, GENICULATE ANTENNA: In alcohol the antenna is distinctly geniculate, i.e., its distal group of swollen articles is bent angularly to the axis of the series of more proximal filiform articles. This condition is not evident in figure 8 because in Hoyer's mountant an antenna tends to swell very slightly and to straighten.

NOTE H, POSTERIOR GEMINATE SETAE: In many geophilomorph genera—including some quite distantly related and representing different families—I have found a distinctive pair of clypeal setae to be of quite constant occurrence. Because these exhibit certain special characteristics and should prove to be of systematic significance, I term them specifically the posterior geminate setae. They always occur as a pair on or close to the body midline and usually somewhere on the posterior part of the clypeus, often quite close to the labrum. If they are homologous between groups, say from family to family, then they are conceivably persistent and very primitive structures. The alternative possibility, that they are only analogous and have arisen independently many times, of course, is not easy to discredit, especially since the geminate setae occur so widely and

apparently subserve some highly specialized sensory function. They may well have been "invented" a number of times in quite different organisms. One is reminded in this connection of the example of the eyes of squid and of vertebrates, organs that are grossly quite similar but not homologous. I believe that the posterior geminate setae serve a special sensory role of some sort and that they will prove important systematically once they have been investigated on a sufficiently broad scale.

NOTE I, THE STATUMEN: The signal characteristic of the *Chilenophilinae* is the thickened sclerotic ridge running obliquely forward on each second maxillary coxosternite and passing ectal to the maxillary pore. To resolve the confusion that has arisen from the application of numerous phrase designations in each of the major languages, I have proposed that this ridge be given a single Latin name, "statumen" (strut or support, pl. "statumina"). Future studies may show that the definition of the statumen given above may require further restriction since there is some evidence to support the suspicion that not all statumina are homologous; i.e., some kinds may have arisen through evolutionary convergency. If this convergency can be proved, then it could follow that the group now recognized as the *Chilenophilinae*, (or *Chilenophilidae*) would require a general reorganization, possibly involving at least a partial fusion with fractions of the pachymeriine *Geophilidae*.

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